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IN SERVICE TRAINING IN COMPUTER ASSISTED INSTRUCTION FOR VOCATIONAL TEACHERS. FINAL REPORT.

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This project was the third in a proposed 5-phase project for developing vocational education curriculum for junior and senior high school students. Thirteen vocational education teachers participated during the period from July 13 to October 15, 1966. A specific objective for each participant was to develop a 1-semester course in his particular subject area which would be used in establishing a Computer Assisted Instruction (CAI) Curriculum in vocational education. The objective of completing a semester's course appeared to have been too ambitious. From 50 to 150 hours of work was required to produce one 40-minute class lesson. Only one to one and one half class lessons could be prepared since the participants spent 15 hours in preparation each week, outside of the required attendance of 2 hours each evening on Monday through Thursday, in 6 weeks. The most important single impediment of the project was the lack of reliability of the CAI equipment. Recommendations and guidelines for future programs are listed. A sample course section, "Introduction to Data Processing," for CAI instruction is included in the appendix. (PS)

c.1

# COMPUTER ASSISTED INSTRUCTION

PROVIDENCE COLLEGE COMPUTER CENTER

U. S. OFFICE OF EDUCATION

CONTRACT

OE - 7 - 062811 - 0016

VT004304

ED021988

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OFFICE OF EDUCATION

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Final Report

Project No. 6-2811

TITLE: "In Service Training in Computer Assisted Instruction for Vocational Teachers."

AUTHOR: Robert R. Reynolds

INVESTIGATOR: G. C. McGregor, ~~O.P.~~

GRANT NUMBER: OEG1-7-062811-0016
Vocational Education Act of 1963,
P. L. 88-210, Sec 4 (c)

GRANTEE INSTITUTION: Providence College
Providence, Rhode Island

DATE: July 13, 1966--October 15, 1966

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Division of Adult and Vocational Research

# SUMMARY OF PROJECT NO. 6-2811

GRANT NUMBER: OEG1-7-062811-0016

TITLE: "In Service Training in Computer Assisted Instruction for Vocational Teachers."

INVESTIGATOR: G. C. McGregor, O. P.

INSTITUTION: Providence College
Providence, Rhode Island

DURATION: July 13, 1966--October 15, 1966

PURPOSE: The purpose of this project was to allow the participants to revise, rewrite, and evaluate course material in hopes of producing one unit or semester of work in Computer Assisted Instruction mode.

PROCEDURE: Formal instruction in the use of the Coursewriter Language and discussion periods were conducted four evenings per week, for two hours each evening. Each participant was required to attend these sessions. At his convenience, each participant was required to schedule two hours of computer time to be used to test stored materials and revise or enter new course data. Any procedural difficulties encountered during the entry or testing of material were discussed at the evening sessions. Many of the recommendations and guidelines for future programs resulted from these discussion periods.

RESULTS AND CONCLUSIONS:

This project was the third phase in a proposed five phase project which was hoped to result in a vocational education curriculum for junior and senior high school students. The third phase was designed to produce course material which would be used to test student progress, or the lack thereof, when instruction was presented in Computer Assisted Instruction mode. Although we realize that the scope of our objective, to produce one semester of work, was too broad to be wholly achieved, we feel that several participants have made significant progress in realizing the spirit of this objective. (See Appendix 1.)

1. Each participant entered some portion of his program.

2. Most participants wrote and planned material in excess of the amount he was able to enter.

3. Additional experience gave rise to a good deal of revision and expansion of previously entered material.

4. Many participants assisted each other by acting in the role of students to test previously entered material. This brought to light problems in the selection of wording in both directions and text material, in formating of text material, and in the need for expanded use of functions.

5. Several visitors to the computer center were allowed to try course material and were enthusiastic about the potential of CAI. (See Appendix 2.)

6. Provision has been made in many programs for the use of the tape recorder and slide projector features of our system.

7. Each participant developed a high degree of proficiency in the following CAI skills:

   a. Initializing the system.
   b. Inserting and deleting course material.
   c. Polling the units of the system.
   d. Functioning in the role of the author, student, and the proctor.

8. Many participants continued working on their programs well beyond the six week workshop period. Several continued through the Labor Day weekend.

The process of learning to write effective programs in Computer Assisted Instruction mode is a very slow process. Continual revision is necessary as an author reaches new plateaus of understanding and proficiency revealing inadequacies of the past. The author must assume an active and self-directing role. His best support is the stimulation provided by the company of others similarily engaged in CAI.

The amount of time and effort expended by the participants in this project attest to the ability of CAI to capture the imagination and to provide a continuing motivating force, despite failures of equipment and frustration of constant revision of materials. It is our belief that the enthusiastic reception by the participants and visitors, who have been able to be engaged in CAI, indicates the future effectiveness of the computer in education.

It is the belief of the participants that the discipline imposed by their individual CAI projects--being com-

pelled to view a curriculum as a detailed, preplanned entity--has produced a heightened appreciation of the learning process and improved their effectiveness as teachers.

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## STATEMENT OF PURPOSE

The purpose of this project covering the period of July 13, 1966 to October 15, 1966 was to test and evaluate course sectors leading to the development of one semester courses which would be used in establishing a Computer Assisted Instruction Curriculum in vocational education for junior and senior high school students.

## GENERAL OBJECTIVES

1. To test and evaluate course material.
2. To revise and expand previously written material.
3. To develop proficiency in the use of the Computer Assisted Instruction system as a proctor, an author, and as a student.
4. To develop a better appreciation in the problems of developing a curriculum in Computer Assisted Instruction mode.

## SPECIFIC OBJECTIVES

1. Each participant was to complete the writing of one unit or semester of material in his particular course area.

2. Each participant was to enter as much of his course material as possible on the disk storage unit.

3. Each participant would select two high school students to test his course material.

4. Each participant would utilize the record of student responses to evaluate his course material.

## DESCRIPTION OF PROJECT

The project was directed by the Rev. G. C. McGregor, O.P. and supervised and coordinated by Mr. Paul Bartolomeo. Workshop periods were conducted on Monday through Thursday from 7:00 to 9:00 PM July 5 to August 12, 1966. These evening sessions were conducted in the workshop style, except that two hours was reserved for formal instruction in the Coursewriter language. Due to the fact that only two terminals were available, participants were required to schedule two hours of computer time outside of the normal class hours to enter and test their course material.

One hour of each evening session was devoted to the accomplishment of our general objectives of developing proficiency in role of the author, proctor and student on the system. The remaining hour was used for discussion, conferences with the instructor, working alone, or observation of other participants utilizing the system.

About August 1, 1966, a new method of entering course material into storage was made available by the University of Texas. This method enabled the participants to write their course material on coding sheets and to have this material punched into cards. However, our equipment would not accept this method and IBM technicians had to be called upon to make necessary adjustments. Unfortunately, this work could not be completed before the end of the workshop period. We did begin formal instruction in the use of the coding sheets so that as soon as the system was adjusted, course material could be entered by this media.

Each participant was evaluated by the director and coordinator of the project. Quality of written material, degree of professional improvement, proficiency in use of the equipment, and demonstration of interest as evidenced by independent pursuit of learning, extra hours of work, superior degree of workshop participation, and attitude were considered in obtaining the participant's final grade.

## STUDENT SELECTION

The thirteen vocational education teachers who participated in this project are the same participants who took part in earlier phases of this project under U. S. Office of Education contracts OE-5-85-105 and OE-6-85-093. All members of this group were selected on the basis of their scores on the IBM Programmers Aptitude Test. The names of the participants will be found in Appendix V.

## PROJECT EVALUATION

The project was not free from technical difficulties inherent in experimental situations. Repeated equipment failure shut down the system many days and snarled input. Some logic difficulties in the Coursewriter language were encountered. Disks damaged in transit required re-entering. As a result, the entering and testing of course sectors fell well behind schedule. This caused problems in motivation for the authors. A more detailed explanation of the technical difficulties may be found in Appendix 8.

The stated objective of completing a semester's course appears to have been too ambitious. As the work progresses, there is an increasing realization that a great deal of time is required to produce a CAI course approaching professional quality. Anywhere from 50 to 150 hours is required to produce a forty minute lesson. Much of this time is taken up in revising, rewriting, and re-entering data in addition to writing and entering new material. Many of the participants worked well beyond the grant period, several right through Labor Day weekend.

The manner in which classes were conducted seems to have achieved the kind of atmosphere that was desired. Teachers were able to pursue that which was of immediate concern to them. They shared their experience by giving others their perspectives and opinions. Programming problems were solved with individual guidance from the instructor. Extemporaneous group or class discussions delved into matters of common concern. It is felt that more formal methods tend to discourage individual involvement, discovery, and creativity, and to distort specialized subject matter into stereotyped and inappropriate patterns.

We feel that the following results have been achieved:

1. Each participant entered some portion of his program.

2. Most participants wrote and planned material in excess of the amount he was able to enter.

3. Additional experience gave rise to a good deal of revision and expansion of previously entered material.

4. Many participants assisted each other by acting in the role of students to test previously entered material. This brought to light problems in the selection of wording in both directions and text material, in formatting of text material, and in the need for expanded use of functions.

5. Several visitors to the computer center were allowed to try course material and were enthusiastic about the potential of CAI. (See Appendix 2.)

6. Provision has been made in many programs for the use of the tape recorder and slide projector features of our system.

7. Each participant developed a high degree of proficiency in the following CAI skills:

   a. Initializing the system.
   b. Inserting and deleting course material.
   c. Polling the units of the system.
   d. Functioning in the role of the author, student, and the proctor.

8. Many participants continued working on their programs well beyond the six-week workshop period. Several continued through the Labor Day weekend.

9. Each participant has become familiar with the new punch card method of inputing course material.

We definitely believe that the batch-load method, punch card method, of inputing course material offers tremendous advantages over the entering of material through the 1050 Communications Terminal. As stated in our report, under U. S. Office of Education Contract OE-6-85-093, the 1050 Communications Terminal is not an efficient method of input unless the author has the ability to type. No consideration was given to the participants' typing ability as a prerequisite to admission to the project. Although the necessary adjustments needed to adapt our equipment to accept the batch-load method were not completed before the end of the grant period, many participants had begun to write course material for entry by this method.

## CONCLUSIONS

The project has satisfied most of the general and specific objectives stated in this report. We do feel that the objectives of producing a full smeester of work and a vocational education curriculum are much too ambitious for a project of this nature. 50 to 150 hours of work are required to produce one 40-minute class lesson. Considering the participants spent 15 hours in preparation each week, outside of the required attendance, in six weeks, only one to one and one half class lessons could have been prepared. This would be far less than that required for one semester let alone a full curriculum.

The most important single impediment in preventing this project from progressing at a higher rate of efficiency was the lack of reliability of our CAI equipment. Most participants wrote far more material than could be entered. Yet, even the data which was entered was, in several instances, destroyed by equipment malfunction. The idea of presenting demonstrations for high ranking school administrators was approached cautiously for fear of adverse reaction due to the unreliability of the equipment. Several authors experienced so much difficulty, they would not bring their students to test material. Finally, we experienced a severe problem in morale among the participants themselves.

One difficulty which we have mentioned in previous reports seems to have been overcome. The development of the batch-load method of entering course material should enable the authors to enter data at a higher rate. In addition, plans have been made to store data on punched cards at periodic intervals, and on magnetic tape before each author work period. After the work period, the updated course will be entered on magnetic tape by the technical personnel to provide a back-up system. These procedures should prevent the destruction of previously entered materials, and an efficient re-entry method will be established in the event of equipment malfunction.

In spite of the problems, which are not unusual in an experimental situation, we are confident that Computer Assisted Instruction provides the most versatile teaching aid to be yet devised. The teacher is freed from the dual task of information transmission and drill. His creative talents can now be utilized to provide instruction for the gifted or exceptional students. The student is required to assume an active role at all times, and the program is tailored to allow him to progress at his own pace. This continual involvment and the immediate knowledge of success or failure should prove to be a positive motivational force.

## RECOMMENDATIONS

1. A technical bulletin should be instituted as soon as possible.

2. A users group should be started among the various colleges and universities in Rhode Island which have CAI compatible equipment.

3. More realistic objectives should be established.

4. A review of present equipment should be made, especially the student terminals.

5. There should be coordination, through the U.S. Office of Education, to keep participants in various CAI projects abreast of the newest developments in the field.

6. Individual initiative should be encouraged in entering and testing materials.

7. One session a month should be utilized to document difficulties experienced by the participants with either Coursewriter or the terminal equipment.

8. Visitors should be encouraged to test CAI as soon as equipment is proven reliable.

9. An inservice program for teachers in other fields should be instituted. This could be done with or without equipment.

## GUIDELINES

1. Formal instruction in the use of Coursewriter should be continued with special emphasis on the use of functions.

2. The workshop approach should be utilized.

3. All course material should be written prior to formal workshop or class sessions.

4. Authors should be required to utilize the batch-load method of entry. The 1050 terminal use should be limited to testing and minor corrections of format or logic.

5. Author logs for both time spent in preparing material and problems encountered in entering or testing data should be maintained weekly.

6. New participants should be solicited, utilizing the previous participants as instructors.

7. Outside evaluation of course material should be obtained.

8. The objective of producing a single semester of work should be maintained, but the objective of producing a vocational education curriculum in Computer Assisted Instruction mode should be dropped.

9. Future programs should make provision for typists or require the participants to be able to type.

10. Participants should be appraised as to the number of hours of commitment that will be required.

# APPENDIX I

Sample course sections completed during the July to August, 1966, phase of the project in Computer Assisted Instruction.

demo1,s1100
your name is R. R. Reynolds ds1

Introduction to Data Processing

Prepared by

Mr. Robert R. Reynolds

for

Computer Assisted Instruction

Providence College

Providence, Rhode Island

1965--1966

You are about to begin a course designed to introduce you to some of the automated devices used to process data. The course is divided into three basic sections:

1. Simple devices
2. Unit Record Equipment
3. Electronic Computer

Please depress the response key [Altn coding and 5].

The objective of this section is to acquaint you with some of the simple automated devices used in the modern business world. Carbon paper is the simplest automated device. The impression of the original is transferred to a copy by the carbon automatically.

Sensitized paper, developed by the National Cash Register Company, is our next simple device. This paper is treated with chemicals. Original impressions are transferred automatically to the copies without the smudging or mess of carbon paper.

Our next device is familiar to most people. Credit cards, charge account plates, name and address plates, etc., are forms of the embossed plate. Embossed plates are made of plastic or metal. Data on the plate is raised or embossed. Carbon paper or an inked ribbon is placed between the document and the plate. Pressure is applied by a roller, and the data is transferred.

Please key an eob [altn coding and 5].

Indicate your answers by using the LETTER ONLY.
Which of the following is the simplest form of automated device used in today's business office?

[a] Embossed plate
[b] Sensitized paper
[c] Punched card
[d] Carbon paper

b
b - not accepted
Incorrect. Try again.
a
a - not accepted
Incorrect. Did you follow the directions carefully? Try again.

d
Very good. Let's go on.
Paper that has been treated wish chemicals and is used to make copies of an original document is called:

[a] Carbon paper
[b] Inked paper
[c] Sensitized paper
[d] Copy paper

c
Very good.
The impression of an ------ ------ is made by means of a pressure roller and carbon paper or inked ribbon.

[a] Embossed plate
[b] Identification cards
[c] Invoice
[d] Order

a
Fine. Now you are ready to go on to the next assignment.

Another simple automated device is the pegboard. A pegboard is a flat writing surface with numbered pegs or posts along one side. Forms are punched with holes to match the pegs for alignment.

Look at the first illustration. When you are ready to go on, key an eob [altn coding and 5].

Data is transferred from one form to another by carbon or sensitized paper. The master list is placed on the pegboard first. Then the carbon paper is placed on top. Each additional form is then placed on top. The original is the last to be set on the pegboard. All forms to be used must be coordinated.

Each original is aligned to the pegs in descending order. As our illustration demonstrates, each check would be placed on the pegboard a bit lower than the one before it. When we are finished, we will have a master list or listing without having to copy the data from the original several times.

Please key an eob.

//ss002x//
Indicate your answer by typing the word or words that identify your selection.
A flat writing surface with numbered pegs along one edge is known as a --------.
pegboard
Data on the original is transferred to a copy or master list by means of -------.
carbon paper
Forms are aligned or lined up by using the numbered ----- along the edge of the board.
pegs
That's it, You are doing well. Keep it up.
The advantage of using a pegboard is that we may have a copy or a ----- without having to rewrite the data on the original document.
mastr list
Forms used with the pegboard are aligned with the pegs on the board by means of------on the edge of the form.
holes
Fine. Your answer is correct. Let's try the next section.

Our final simple device is a bit more complex than the others. The Keysort Process uses a card with holes punched on the edges of the card.

Please turn to the second illustration.

Information is recorded on the card by notching the holes. These holes may be grouped together to represent data. Holes grouped in this manner are called code fields. The number of holes in each group may vary to meet the needs of the user. A code known as the binary code is used to represent data. Only numeric data may be recorded.
When you are ready to go on, please key an eob.

Inorder to sort or select data from the cards, we pass a steel rod or needle through the holes in the edge of a deck of cards. The cards that have been notched will fall from the needle, and the unnotched cards will remain on the needle. This procedure will be followed for each position in the code field. Once data has been recorded manually into the cards, the sorting or selection of data is automatic.
Please key an eob.

Supply only the LETTER that indicates your answer.
The fields on a keysort card are:
[a] on the top
[b] on the edge
[c] in the middle
[d] all over the card

c
sorry, but that's not it. Try once more.
b
Very good. Let's go on to the next question.
//ss009 //Note that the picture of the Keysort card shows that the school code has been notched.
What is the school number that has been notched into the card?
help
24
24
If the keysort needle is passed through a deck of cards, and this card was in the deck, would it fall into the tray or remain on the needle if you wanted schools 10-19?
remain on the needle
If we want to identify the cards used to register boys from those used to register girls, only one position or code field would be necessary. The cards used for boys could be notched, and the ones used for girls would not be notched.//ss010x//
Therefore, boys' cards would fall to the tray and the girls' cards would -----.
remain
The keysort process is the first of our simple automated devices for processing data that resembles the equipment used in card processing systems of today. Our next section will be on unit record systems of processing data. Before we can go on to our new work, we will have a short quiz on the material we have already covered.
If you wish to take the quiz, please type yes. If you do not wish to take the quiz at this time, please type no.
yes
1. The simplest form of automated device is -------.
help
No help given.

carbon paper
Try the next one.
2. Name one other simple automated device.
embossed plate
Let:s go on.

3. A credit card is a form of the ------.
embossed plate
Try the next question.
4. The ------ uses numbered pegs to align forms.
peg board
Each answer is being recorded. You may obtain your score at the end of the test from your instructor.
5. The holes around the edge of the ----- card are notched to record data.
keysort
Go on.
6. Although data is recorded manually on the keysort card, the selection or sorting of cards is -----.
automatic
Next question.
7. The unnotched holes on the keysort card cause the cards to ----- on the needle.
stay
You have completed the quiz.
Would you like to know your score? Type yes or no.
yes
You received an A. Let:s go on to the next section. Please depress the a key.
a

Section 2

We can conclude from the previous section on simple devices that automation is not a machine. Rather it is a process. The chief aim of automation is to reduce human effort and handling to obtain less error. The secondary aim is to increase the processing speed. We shall now attempt to apply the principles of automation to Data Processing.

Data processing is the processing of information. The huge volumes of data that must be handled every day by business, science and government staggers the imagination. It is physically impossible to process, catalogue and store all the vast quantities of information accumulated by all sources without the help of machines. Automated equipment enables us to gather data, manipulate it, draw conclusions from it, and store it for future use. Routine handling can be performed at high speeds, freeing men and women for more important tasks. These machines can do many of the tasks that humans find boring without becoming bored. Because our machines do not become bored or tired, they make very few mistakes. Most errors that do occur are the result of human error or machine malfunction.

All information handling, or data processing, goes through a cycle. First, the data to be processed must be assembled. Then it must be recorded in a convenient form. Next, it must be manipulated. The results must be reported. Finally, it must be stored. The next slide shows the data processing cycle in sequence. Please depress the response key.
//ss010 //
end of course.
you have been signed off.

```
demo1,a0001
your name is       R. R. Reynolds
type control word
type reyn//finish
reyn
begin
   1        rd              Introduction to Data Processing
   2
   3                                Prepared by
   4
   5                          Mr. Robert R. Reynolds
   6
   7                                  for
   8
   9                    Computer Assisted Instruction
  10
  11                          Providence College
  12
  13                         Providence, Rhode Island
  14
  15                               1965--1966


  16
  17                 You are about to begin a course designed to introduce you to some of
  18
  19            the automated devices used to process data. The course is divided into

  20
  21            three basic sections:
  22
  23                               1. Simple devices
  24
  25                               2. Unit Record Equipment
  26
  27                               3. Electronic Computer
  28
  29                 Please depress the response key [Altn coding and 5].
secla
   1        rd       The objective of this section is to acquaint you with some
   2              of the simple automated devices used in the modern business world.
   3              Carbon paper is the simplest automated device.  The im-
   4              pression of the original is transferred to a copy by the carbon
   5              automatically.
   6                   Sensitized paper, developed by the National Cash Register
   7              Company, is our next simple device.  This paper is treated
   8              with chemicals.  Original impressions are transferred automa-
   9              tically to the copies without the smudging or mess of carbon paper.
  10                   Our next device is familiar to most people.  Credit cards, charge
  11              account plates, name and address plates, etc., are forms of the
  12              embossed plate.  Embossed plates are made of plastic or metal.
  13              Data on the plate is raised or embossed.  Carbon paper or an
  14              inked ribbon is placed between the document and the plate.
  15              Pressure is applied by a roller, and the data is transferred.
  16                   Please key an eob [altn coding and 5].
seclaq1
   1        qu Indicate your answers by using the LETTER ONLY.

   2              Which of the following is the simplest form of automated device used in to-

   3              day's business office?
   4                                [a]  Embossed plate
   5                                [b]  Sensitized paper
   6                                [c]  Punched card
   7                                [d]  Carbon paper
```

```
        ca d
        cb D
        ty Very good. Let's go on.
        wa carbon paper
        wb Carbon paper
        wa cbn ppr
        fn kl        //2nt//Typing error.
        ty Incorrect. You did not follow directions. You were asked to use the LETTER
           only to indicate your answer. Please follow directions and try again.
        un Incorrect. Try again.
        un Incorrect. Did you follow the directions carefully? Try again.
        un Incorrect. The correct answer is d, carbon paper. Let's be a bit more

           careful when reading and make sure you follow the directions. Go on to
           the next question.
        br seclaq2
seclaq2
        qu Paper that has been treated with chemicals and is used to make copies of
           an original document is called:
                           [a]  Carbon paper
                           [b]  Inked paper
                           [c]  Sensitized paper
                           [d]  Copy paper
        ca c
        cb C
        ty Very good.
        wa sensitized paper
        wb Sensitized paper
        wa sens ppr
        fn kl        //2nt//Typing error.
        ty You did not follow directions. Use the LETTER ONLY! Try again.
        un Sorry. Try again.
        un The correct answer is c, sensitized paper. Go on to the next question.
        br seclaq3
seclaq3
        qu The impression of an ------  ------ is made by means of a pressure roller
           and carbon paper or inked ribbon.
                           [a]  Embossed plate
                           [b]  Identification cards
                           [c]  Invoice
                           [d]  Order
        ca a
        cb A
        ty Fine. Now you are ready to go on to the next assignment.
        wa embossed plate
        wb Embossed plate
        wa embsd plt
        fn kl        //2nt//Typing error.
        ty You did not follow directions. Use only the LETTER. Try
           again.
        un Afraid not. Try again.
        un What happened!! That's not right either. Try once more.
        un Nope.  You should have answered a, embossed plate.  Let:s
           try the next assignment.
        br sec1b
sec1b
        rd
                Another simple automated device is the pegboard.  A peg-
           board is a flat writing surface with numbered pegs or posts along
           one side.  Forms are punched with holes to match the pegs for
           alignment.
                Look at the first illustration.  When you are ready to go
```

```
          on, key an eob [altn coding and 5].
        rd      Data is transferred from one form to another by carbon or
          sensitized paper.  The master list is placed on the pegboard
          first.  Then the carbon paper is placed on top.  Each addi-
          tional form is then placed on top.  The original is the last to
          be set on the pegboard.  All forms to be used must be coordi-
          nated.
               Each original is aligned to the pegs in descending order.
          As our illustration demonstrates, each check would be placed on
          the pegboard a bit lower than the one before it.  When we are
          finished, we will have a master list or listing without having to
          copy the data from the original several times.
               Please key an eob.
        ty //ss002x//
sec1bq1
        qu Indicate your answer by typing the word or words that identify
          your selection.
          A flat writing surface with numbered pegs along one edge is
          known as a --------.
        ca no help given.

        ca pegboard
        cb Pegboard
        ca pgbd
        fn k1         //1nt//Watch your typing.
        ty You are correct.
        wa peg board
        wb Peg board
        wa pg bd
        fn k1         //2nt//Typing error.
        ty Okay, but pegboard is one word.
        br sec1bq2
        un This answer is not correct. Remember that typing errors are

          considered as incorrect answers. Try again.
        un I'm afraid not. LET␣S GO BACK AND READ AGAIN.
        br sec1b
sec1bq2
        qu Data on the original is transferred to a copy or master list

          by means of -------.
        ca no help given.

        ca carbon
        cb carbon paper
        ca cbn pr
        fn k1         //2nt//Be careful of typing errors.
        cb sensitized paper
        cb sens pr
        fn k1         //2nt//Watch your typing errors.
        cb carbon or sensitized paper
        cb sensitized or carbon paper
        cb cbn or sens pr
        fn k1         //4nt//Typing error.
        fn edit1s     //sh//c/r
        ty Your answer is correct. Let's go on.
        un Wrong. LET␣S TRY AGAIN.
        un Check your typing and try again.
        un Sign off and get help from your instructor.
sec1b q3
        qu Forms are aligned or lined up by using the numbered ----- along
          the edge of the board.
        ca no help given.
```

```
        ca posts
        cb pegs
        cb pegs or posts
        cb posts or pegs
        fn editls    //sh//c/r
        ty That's it,  You ard doing well.  Keep it up.
        un That's not it.  Try once more.
        un What's the matter?  That is not the correct answer.  Let's go on anyway and see if you cannot do better
        br seclb q4
seclb q4
        qu The advantage of using a pegboard is that we may have a copy or
           a ----- without having to rewrite the data on the original document.
        ca no help given.

        ca master list
        cb master
        ca mstr lst
        fn kl        //2rt//Be careful of typing errors.
        ca listing
        ca lstg
        fn kl        //1nt//watch typing errors.
        fn editls    //sh//c/r
        wa duplicate
        fn editls    //sh//c/r
        ty This is a good try, but I was looking for a term mentioned in the text.
           Try again.
        un This answer is not correct.  Try again.
        un We still can:t seem to get together.  Try once more.
        un The correct answer is master list.  Let's go on.
        br seclb q5
seclb q5
        qu Forms used with the pegboard are aligned with the pegs on the board by means
           of-------on the edge of the form.
        ca no help given.

        ca punched holes
        fn editls    //sh//sp//c/r
        ca holes
        fn editls    //sh//c/r
        ty Fine.  Your answer is correct.  Let's try the next section.
        un Sorry, try again.
        un Sign off and see your instructor.
seclc
        rd      Our final simple device is a bit more complex than the
           others.  The Keysort Process uses a card with holes punched on
           the edges of the card.
                Please turn to the second illustration.
        rd      Information is recorded on the card by notching the holes.
           These holes may be grouped together to represent data.  Holes
           grouped in this manner are called code fields.  The number of
           holes in each group may vary to meet the needs of the user.  A
           code known as the binary code is used to represent data.  Only
           numeric data may be recorded.
                When you are ready to go on, please key an eob.
        rd      Inorder to sort or select data from the cards, we pass a
           steel rod or needle through the holes in the edge of a deck of
           cards.  The cards that have been notched will fall from the
           needle, and the unnotched cards will remain on the needle.  This
           procedure will be followed for each position in the code field.
           Once data has been recorded manually into the cards, the sort-
           ing or selection of data is automatic.
                Please key an eob.
```

```
 19                Please key an eob.
sec1c q1
  1        qu Supply only the LETTER that indicates your answer.
    The fields on a keysort card  are:
  2                              [a] on the top
  3                              [b] on the edge
  4                              [c] in the middle
  5                              [d] all over the card
  6        ca b
  7        fn edit1s    //sh//c/r
  8        ty Very good.  Let's go on to the next question.
  9        wa d
 10        ty This is not quite correct, but why don't you try again.
 11        un sorry, but that's not it.  Try once more.
 12        un The correct answer is b, on the edge.  Go on to the next
 13            question.
 14        br sec1c q2
sec1c q2
  1        qu //ss009 //
  2           Note that the picture of the Keysort card shows that the school
  3           code has been notched.
  4           What is the school number that has been notched into the card?
  5        ca 24
  6        ca twentyfour
  7        fn edit1s    //sh//sp//c/r
  8        un Did you look at the school code?  Try again.
  9        un Try 24.
sec1c q3
  1        qu If the keysort needle is passed through a deck of cards, and this card
  2           was in the deck, would it fall into the tray or remain on the needle if
  3           you wanted schools 10-19?
  4        ca remainontheneedle
  5        fn edit1s    //all
  6        ca remain
  7        fn edit1s    //sh//c/r
  8        ty We can also conclude from your answer that this card must contain data
  9           concerning some other school.  So it is possible to obtain two types
 10           of data from the keysort card--positive or negative.
 11        un Unnotched cards would remain on the needle.  Notched cards would fall
 12           to the tray.
 13        br sec1c q4
sec1c q4
  1        qu If we want to identify the cards used to register boys from those used to
  2           register girls, only one position or code field would be necessary.  The
  3           cards used for boys could be notched, and the ones used for girls would not
  4           be notched.//ss010x//
  5                Therefore, boys' cards would fall to the tray and the girls' cards would
  6           -----.
  7        ca remainontheneedle
  8        fn edit1s    //all
  9        ca remain
 10        fn edit1s    //sh//c/r
 11        un remain on the needle.
 12        br sec1c q5
sec1c q5
  1        qu      The keysort process is the first of our simple automated devices for
  2           processing data that resembles the equipment used in card processing systems
  3           of today.  Our next section will be on unit record systems of processing
  4           data.  Before we can go on to our new work, we will have a short quiz on
  5           the material we have already covered.
  6                If you wish to take the quiz, please type yes.  If you do not wish to
  7           take the quiz at this time, please type no.
  8        ca yes
  9        fn edit1s    //sh//c/r
```

```
  10        wa no
  11        fn edit1s    //sh//c/r
  12        ty When you are ready to take the quiz, please use the following format.  Use
  13           the control words--go to--and the label sec1test.  You should copy this
  14           format before signing off.  Please sign off.
  15        un Please type yes or no!
sec1test
   1        qu 1.  The simplest form of automated device is -------.
   2        ca No help given.
   3        ca carbonpaper
   4        fn edit1s    //all
   5        ad 1//c1
   6        ty Try the next one.
   7        un Try the next one.
   8        ad 1//c1
   9        br test1q2
test1q2
   1        qu 2.  Name one other simple automated device.
   2        ca No help given.
   3        ca embossedplate
   4        cb sensitizedpaper
   5        cb pegboard
   6        cb keysort
   7        cb keysortprocess
   8        fn edit1s    //all
   9        ad 1//c1
  10        ty Let:s go on.
  11        un Let:s go on.
  12        ad 1//c2
  13        br test1q3
test1q3
   1        qu 3.  A credit card is a form of the ------.
   2        ca No help given.
   3        ca embossedplate
   4        fn edit1s    //all
   5        ad 1//c1
   6        ty Try the next question.
   7        un Try the next question.
   8        ad 1//c2
   9        br test1q4
test1q4
   1        qu 4.  The ------ uses numbered pegs to align forms.
   2        ca No help given.
   3        ca pegboard
   4        fn edit1s    //all
   5        ad 1//c1
   6        ty Each answer is being recorded.  You may obtain your score at
   7        ty the end of the test from your instructor.
   8        un Each response is being recorded.  You may obtain your score at
   9           the end of the test from your instructor.
  10        ad 1//c2
  11        br test1q5
test1q5
   1        qu 5.  The holes around the edge of the ----- card are notched to
   2           record data.
   3        ca No help given.
   4        ca keysort
   5        fn edit1s    //all
   6        ad 1//c1
   7        ty Go on.
   8        un Go on.
   9        ad 1//c2
  10        br test1q6
```

```
test1q6
   1        qu 6.  Although data is recorded manually on the keysort card, the
   2           selection or sorting of cards is -----.
   3        ca No help given.
   4        ca automatic
   5        fn edit1s    //all
   6        ad 1//c1
   7        ty Next question.
   8        un Next question.
   9        ad 1//c2
  10        br test1q7
test1q7
   1        qu 7.  The unnotched holes on the keysort card cause the cards to
   2           ----- on the needle.
   3        ca No help given.
   4        ca remain
   5        cb stay
   6        fn edit1s    //all
   7        ad 1//c1
   8        ty You have completed the quiz.
   9        un You have completed the quiz.
  10        ad 1//c2
  11        br test1end
test1end
   1        qu Would you like to know your score?  Type yes or no.
   2        ca yes
   3        br scrt1d    //-4//c1
   4        br scrt1c    //-5//c1
   5        br scrt1b    //-6//c1
   6        br scrt1a    //-7//c1
   7        ca no
   8        ty You may obtain your score from your instructor at a later time.
   9        rd Please depress the eob [altn coding and 5].
  10        br sec2
scrt1a
   1        qu You received an A.  Let:s go on to the next section.  Please
   2           depress the a key.
   3        ca a
   4        br sec2
   5        un Please depress the a key!
scrt1b
   1        qu You received a B.  Proceed to the next section.  Please
   2           depress the a key.
   3        ca a
   4        br sec2
   5        un Please depress the a key!
scrt1c
   1        qu You received a C.  Proceed to the next section.  Please
   2           depress the a key.
   3        ca a
   4        br sec2
   5        un Please depress the a key!
scrt1d
   1        qu You did not do too well.  Your grade is a D.  This means
   2           you had 3 or more incorrect answers.  Let:s see if you can do a
   3          better job on the next section.  Please strike the a key.
   4        ca a
   5        br sec2
   6        un Please strike the a key!
```

```
sec2
    1       rd                    Section 2
    2            We can conclude from the previous section on simple devices that automation
    3          is not a machine.  Rather it is a process.  The chief aim of automation is to
    4          reduce human effort and handling to obtain less error.  The secondary aim is to
    5          increase the processing speed.  We shall now attempt to apply the principles of
    6          automation to Data Processing.
    7               Data processing is the processing of information.  The huge volumes of data
    8          that must be handled every day by business, science and government staggers the
    9          imagination.  It is physically impossible to process, catalogue and store all the
   10          vast quantities of information accumulated by all sources without the help of machines.
   11          Automated equipment enables us to gather data, manipulate it, draw conclusions
   12          from it, and store it for future use.  Routine handling can be performed at high
   13          speeds, freeing men and women for more important tasks. These machines can do many
   14          of the tasks that humans find boring without becoming bored.  Because our machines
   15          do not become bored or tired, they make very few mistakes.  Most errors that do
   16          occur are the result of human error or machine malfunction.
   17               All information handling, or data processing, goes through a cycle.  First,
   18          the data to be processed must be assembled.  Then it must be recorded in a convenient
   19          form.  Next, it must be manipulated.  The results must be reported.  Finally,
   20          it must be stored.  The next slide shows the data processing cycle in sequence.
   21             Please depress the response key.
   22          ty //ss010 //
finish
type control word
sign off
you have been signed off.
```

```
.REYN     ‡                                                                    0203451
 BEGIN    ‡                                                                    0203502
    1   RD              I NTRODUCTION TO  D ATA  P ROCESSING ‡                 0203553
    2       ‡                                                                  0203616
    3                       P REPARED BY ‡                                     0203630
    4       ‡                                                                  0203677
    5                     M R.  R OBERT  R. R EYNOLDS ‡                        0203691
    6       ‡                                                                  0203748
    7                         FOR ‡                                            0203762
    8       ‡                                                                  0203803
    9                   C OMPUTER  A SSISTED  I NSTRUCTION ‡                   0203817
   10       ‡                                                                  0203876
   11                     P ROVIDENCE  C OLLEGE ‡                             0203890
   12       ‡                                                                  0203941
   13                   P ROVIDENCE,  R HODE  I SLAND ‡                       0203955
   14       ‡                                                                  0204011
   15                          1965--1966       ‡                             0204025
   16       ‡                                                                  0204076
   17            Y OU ARE ABOUT TO BEGIN A COURSE DESIGNED TO INTRODUCE YOU TO SOME OF ‡  0204090
   18       ‡                                                                  0204179
   19       THE AUTOMATED DEVICES USED TO PROCESS DATA.  T HE COURSE IS DIVIDED INTO   ‡  0204193
   20       ‡                                                                  0204281
   21       THREE BASIC SECTIONS 6  ‡                                          0204295
   22       ‡                                                                  0204332
   23                       1.  S IMPLE DEVICES ‡                              0204346
   24       ‡                                                                  0204395
   25                       2.  U NIT  R ECORD  E QUIPMENT ‡                   0204409
   26       ‡                                                                  0204469
   27                       3.  E LECTRONIC  C OMPUTER ‡                       0204483
   28       ‡                                                                  0204539
   29            P LEASE DEPRESS THE RESPONSE KEY  9A LTN CODING AND 5 0 . ‡   0204553
.SEC1A     ‡                                                                  0204630
    1   RD         T HE OBJECTIVE OF THIS SECTION IS TO ACQUAINT YOU WITH SOME ‡  0264602
    2       OF THE SIMPLE AUTOMATED DEVICES USED IN THE MODERN BUSINESS WORLD. ‡  0264681
    3        C ARBON PAPER IS THE SIMPLEST AUTOMATED DEVICE.   T HE IM- ‡       0264761
    4       PRESSION OF THE ORIGINAL IS TRANSFERRED TO A COPY BY THE CARBON ‡  0264834
    5       AUTOMATICALLY. ‡                                                   0264911
    6            S ENSITIZED PAPER, DEVELOPED BY THE  N ATIONAL  C ASH  R EGISTER ‡  0264939
    7        C OMPANY, IS OUR NEXT SIMPLE DEVICE.   T HIS PAPER IS TREATED ‡   0265023
    8       WITH CHEMICALS.   O RIGINAL IMPRESSIONS ARE TRANSFERRED AUTOMA- ‡  0265099
    9       TICALLY TO THE COPIES WITHOUT THE SMUDGING OR MESS OF CARBON PAPER. ‡  0265176
   10            O UR NEXT DEVICE IS FAMILIAR TO MOST PEOPLE.   C REDIT CARDS, CHARGE ‡  0265257
   11       ACCOUNT PLATES, NAME AND ADDRESS PLATES, ETC., ARE FORMS OF THE ‡   0265345
   12       EMBOSSED PLATE.   E MBOSSED PLATES ARE MADE OF PLASTIC OR METAL. ‡  0264171
   13        D ATA ON THE PLATE IS RAISED OR EMBOSSED.   C ARBON PAPER OR AN ‡  0264249
   14       INKED RIBBON IS PLACED BETWEEN THE DOCUMENT AND THE PLATE. ‡       0264327
   15        P RESSURE IS APPLIED BY A ROLLER, AND THE DATA IS TRANSFERRED. ‡  0264399
   16            P LEASE KEY AN EOB  9 ALTN CODING AND 5 0 . ‡                  0264539
SEC1AQ1    ‡                                                                  0205936
    1   QU  I NDICATE YOUR ANSWERS BY USING THE  LETTER ONLY .   ‡             0205987
    2        W HICH OF THE FOLLOWING IS THE SIMPLEST FORM OF AUTOMATED DEVICE USED IN TO-   ‡  0206054
    3       DAY@S BUSINESS OFFICE /  ‡                                         0206147
    4                          9 A 0  E MBOSSED PLATE ‡                        0206185
    5                          9 B 0  S ENSITIZED PAPER ‡                      0206236
    6                          9 C 0  P UNCHED CARD ‡                          0206293
    7                          9 D 0  C ARBON PAPER ‡                          0206344
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    8   CA D#                                                                                                    0206395
    9   CB  D #                                                                                                  0206409
   10   TY  V ERY GOOD.  L ET@S GO ON. #                                                                         0206425
   11   WA CARBON PAPER#                                                                                         0206466
   12   WB  C ARBON PAPER#                                                                                       0206491
   13   WA CBN PPR#                                                                                              0265422
   14   FN KL         //2NT// T YPING ERROR. #                                                                   0265442
   15   TY  I NCORRECT.  Y OU DID NOT FOLLOW DIRECTIONS.  Y OU WERE ASKED TO USE THE  LETTER  #                  0206518
   16       ONLY TO INDICATE YOUR ANSWER.  P LEASE FOLLOW DIRECTIONS AND TRY AGAIN. #                            0206614
   17   UN  I NCORRECT.  T RY AGAIN. #                                                                           0206699
   18   UN  I NCORRECT.  D ID YOU FOLLOW THE DIRECTIONS CAREFULLY / T RY AGAIN. #                                0206738
   19   UN  I NCORRECT.  T HE CORRECT ANSWER IS D, CARBON PAPER.  L ET@S BE A BIT MORE    #                      0206820
   20       CAREFUL WHEN READING AND MAKE SURE YOU FOLLOW THE DIRECTIONS.  G O ON TO #                           0206911
   21       THE NEXT QUESTION. #                                                                                0206997
   22   BR SEC1AQ2    #                                                                                          0207029
SEC1AQ2    #                                                                                                    0207080
    1   QU  P APER THAT HAS BEEN TREATED WITH CHEMICALS AND IS USED TO MAKE COPIES OF #                          0207131
    2       AN ORIGINAL DOCUMENT IS CALLED 6  #                                                                 0207219
    3                         9 A 0  C ARBON PAPER #                                                            0207266
    4                         9 B 0  I NKED PAPER #                                                             0207317
    5                         9 C 0  S ENSITIZED PAPER #                                                        0207367
    6                         9 D 0  C OPY PAPER #                                                              0207422
    7   CA C#                                                                                                    0207471
    8   CB  C #                                                                                                  0207485
    9   TY  V ERY GOOD. #                                                                                        0207501
   10   WA SENSITIZED PAPER#                                                                                     0207527
   11   WB  S ENSITIZED PAPER#                                                                                   0207556
   12   WA SENS PPR#                                                                                             0265488
   13   FN KL         //2NT// T YPING ERROR. #                                                                   0265509
   14   TY  Y OU DID NOT FOLLOW DIRECTIONS.  U SE THE  LETTER ONLY$ T RY AGAIN. #                                0207587
   15   UN  S ORRY.  T RY AGAIN. #                                                                               0207669
   16   UN  T HE CORRECT ANSWER IS C, SENSITIZED PAPER.  G O ON TO THE NEXT QUESTION. #                          0207704
   17   BR SEC1AQ3    #                                                                                          0207792
SEC1AQ3    #                                                                                                    0207843
    1   QU  T HE IMPRESSION OF AN ------  ------ IS MADE BY MEANS OF A PRESSURE ROLLER #                         0207894
    2       AND CARBON PAPER OR INKED RIBBON. #                                                                 0207983
    3                         9 A 0  E MBOSSED PLATE #                                                          0208030
    4                         9 B 0  I DENTIFICATION CARDS #                                                    0208083
    5                         9 C 0  I NVOICE #                                                                 0208142
    6                         9 D 0  O RDER #                                                                   0208188
    7   CA A#                                                                                                    0208232
    8   CB  A #                                                                                                  0208246
    9   TY  F INE.  N OW YOU ARE READY TO GO ON TO THE NEXT ASSIGNMENT. #                                        0208262
   10   WA EMBOSSED PLATE#                                                                                       0208336
   11   WB  E MBOSSED PLATE#                                                                                     0208363
   12   WA EMBSD PLT#                                                                                            0265555
   13   FN KL         //2NT// T YPING ERROR. #                                                                   0265577
   14   TY  Y OU DID NOT FOLLOW DIRECTIONS.  U SE ONLY THE  LETTER .  T RY #                                     0208392
   15       AGAIN. #                                                                                            0208469
   16   UN  A FRAID NOT.  T RY AGAIN. #                                                                          0208489
   17   UN  W HAT HAPPENED $$ T HAT@S NOT RIGHT EITHER.  T RY ONCE MORE. #                                       0208529
   18   UN  N OPE.   Y OU SHOULD HAVE ANSWERED A, EMBOSSED PLATE.   L ET 6 S #                                  0208604
   19       TRY THE NEXT ASSIGNMENT. #                                                                          0208663
   20   BR SEC1B      #                                                                                          0208721
SEC1B      #                                                                                                    0208772
    1   RD #                                                                                                     0266858
```

```
    2          A NOTHER SIMPLE AUTOMATED DEVICE IS THE PEGBOARD.   A  PEG- ‡                0265623
    3      BOARD IS A FLAT WRITING SURFACE WITH NUMBERED PEGS OR POSTS ALONG ‡              0265702
    4      ONE SIDE.   F ORMS ARE PUNCHED WITH HOLES TO MATCH THE PEGS FOR ‡               0265781
    5      ALIGNMENT. ‡                                                                    0265858
    6          L OOK AT THE FIRST ILLUSTRATION.   W HEN YOU ARE READY TO GO ‡              0265882
    7      ON, KEY AN EOB  9 ALTN CODING AND 5 0 . ‡                                       0265962
    8  RD      D ATA IS TRANSFERRED FROM ONE FORM TO ANOTHER BY CARBON OR ‡                 0266015
    9      SENSITIZED PAPER.   T HE MASTER LIST IS PLACED ON THE PEGBOARD ‡                0266093
   10      FIRST.   T HEN THE CARBON PAPER IS PLACED ON TOP.   E ACH ADDI- ‡               0266169
   11      TIONAL FORM IS THEN PLACED ON TOP.   T HE ORIGINAL IS THE LAST TO ‡             0266246
   12      BE SET ON THE PEGBOARD.   A LL FORMS TO BE USED MUST BE COORDI- ‡               0266325
   13      NATED. ‡                                                                        0266402
   14          E ACH ORIGINAL IS ALIGNED TO THE PEGS IN DESCENDING ORDER. ‡                0266422
   15       A S OUR ILLUSTRATION DEMONSTRATES, EACH CHECK WOULD BE PLACED ON ‡             0266500
   16      THE PEGBOARD A BIT LOWER THAN THE ONE BEFORE IT.   W HEN WE ARE ‡              0266579
   17      FINISHED, WE WILL HAVE A MASTER LIST OR LISTING WITHOUT HAVING TO ‡            0266656
   18      COPY THE DATA FROM THE ORIGINAL SEVERAL TIMES. ‡                               0266735
   19          P LEASE KEY AN EOB. ‡                                                      0266795
   20  TY //SS002X// ‡                                                                   0266834
SEC1BQ1   ‡                                                                             0210407
    1  QU  I NDICATE YOUR ANSWER BY TYPING THE WORD OR WORDS THAT IDENTIFY ‡             0210458
    2      YOUR SELECTION. ‡                                                           0210536
    3       A  FLAT WRITING SURFACE WITH NUMBERED PEGS ALONG ONE EDGE IS ‡             0210565
    4      KNOWN AS A --------. ‡                                                      0210640
    5  CA NO HELP GIVEN.     ‡                                                        0210674
    6  CA PEGBOARD‡                                                                   0210706
    7  CB  P EGBOARD‡                                                                 0210727
    8  CA PGBD‡                                                                       0266871
    9  FN KL         //1NT// W ATCH YOUR TYPING. ‡                                   0266888
   10  TY  Y OU ARE CORRECT. ‡                                                        0210750
   11  WA PEG BOARD‡                                                                  0210782
   12  WB  P EG BOARD‡                                                                0210804
   13  WA PG BD‡                                                                      0266939
   14  FN KL         //2NT// T YPING ERROR. ‡                                        0266957
   15  TY  O KAY, BUT PEGBOARD IS ONE WORD. ‡                                         0210828
   16  BR SEC1BQ2   ‡                                                                 0210875
   17  UN  T HIS ANSWER IS NOT CORRECT.  R EMEMBER THAT TYPING ERRORS ARE   ‡         0210926
   18      CONSIDERED AS INCORRECT ANSWERS.  T RY AGAIN. ‡                            0211005
   19  UN  I @M AFRAID NOT.  LET@S GO BACK AND READ AGAIN. ‡                          0211064
   20  BR SEC1B     ‡                                                                 0211126
SEC1BQ2   ‡                                                                         0211177
    1  QU  D ATA ON THE ORIGINAL IS TRANSFERRED TO A COPY OR MASTER LIST   ‡         0211228
    2      BY MEANS OF -------. ‡                                                     0211306
    3  CA NO HELP GIVEN.     ‡                                                        0211340
    4  CA CARBON‡                                                                     0211372
    5  CB CARBON PAPER‡                                                               0211391
    6  CA CBN PR‡                                                                     0267003
    7  FN KL         //2NT// B E CAREFUL OF TYPING ERRORS. ‡                         0267022
    8  CB SENSITIZED PAPER‡                                                           0211416
    9  CB SENS PR‡                                                                    0267063
   10  FN KL         //2NT// W ATCH YOUR TYPING ERRORS. ‡                           0267103
   11  CB CARBON OR SENSITIZED PAPER‡                                                 0211445
   12  CB SENSITIZED OR CARBON PAPER‡                                                 0211464
   13  CB CBN OR SENS PR‡                                                             0267161
   14  FN KL         //4NT// T YPING ERROR. ‡                                        0267186
   15  FN EDITIS     //SH//C/R‡                                                      0211523
```

```
   16   TY  Y OUR ANSWER IS CORRECT.  L ET@S GO ON. #                                                                  021155
   17   UN  w RONG.  LET@S TRY AGAIN. #                                                                               021160
   18   UN  C HECK YOUR TYPING AND TRY AGAIN. #                                                                       021164
   19   UN  S IGN OFF AND GET HELP FROM YOUR INSTRUCTOR. #                                                            021169
SEC1B Q3  #                                                                                                          021175
    1   QU  F ORMS ARE ALIGNED OR LINED UP BY USING THE NUMBERED ----- ALONG #                                       021180
    2       THE EDGE OF THE BUARD. #                                                                                 021188
    3   CA NO HELP GIVEN.     #                                                                                      021192
    4   CA POSTS#                                                                                                    021195
    5   CB PEGS#                                                                                                     021197
    6   CB PEGS OR POSTS#                                                                                            021198
    7   CB POSTS OR PEGS#                                                                                            021201
    8   FN EDIT1S    //SH//C/R#                                                                                     021204
    9   TY  T HAT@S IT,   Y OU ARE DOING WELL.   K EEP IT UP. #                                                      021207
   10   UN  T HAT@S NOT IT.   T RY ONCE MORE. #                                                                      021213
   11   UN  w HAT@S THE MATTER /  T HAT IS NOT THE CORRECT ANSWER.   L ET@S GO ON ANYwAY AND SEE IF                  021218
       YOU CANNOT DO BETTER. #                                                                                       021230
   12   BR SEC1B Q4  #                                                                                               021236
SEC1B Q4  #                                                                                                          021241
    1   QU  T HE ADVANTAGE OF USING A PEGBOARD IS THAT WE MAY HAVE A COPY OR #                                       021249
    2       A ----- WITHOUT HAVING TO REWRITE THE DATA ON THE ORIGINAL DOCUMENT. #                                   021257
    3   CA NO HELP GIVEN.     #                                                                                      021260
    4   CA MASTER LIST#                                                                                              021262
    5   CB MASTER#                                                                                                   026723
    6   CA MSTR LST#                                                                                                 026725
    7   FN KL        //2NT// B E CAREFUL OF TYPING ERRORS. #                                                         026731
    8   CA LISTING#                                                                                                  026733
    9   CA LSTG#                                                                                                     026735
   10   FN KL        //3NT// W ATCH TYPING ERRORS. #                                                                021264
   11   FN EDIT1S    //SH//C/R#                                                                                     021267
   12   WA DUPLICATE#                                                                                                021270
   13   FN EDIT1S    //SH//C/R#                                                                                     021273
   14   TY  T HIS IS A GOOD TRY, BUT  I  WAS LOOKING FOR A TERM MENTIONED IN THE TEXT. #                             021282
   15       T RY AGAIN. #                                                                                            021284
   16   UN  T HIS ANSWER IS NOT CORRECT.   T RY AGAIN. #                                                             021290
   17   UN  W E STILL CAN 6 T SEEM TO GET TOGETHER.   T RY ONCE MORE. #                                              021297
   18   UN  T HE CORRECT ANSWER IS MASTER LIST.   L ET@S GO ON.  #                                                    021304
   19   BR SEC1B Q5  #                                                                                               021309
SEC1B Q5  #                                                                                                          021314
    1   QU  F ORMS USED WITH THE PEGBOARD ARE ALIGNED WITH THE PEGS ON THE BOARD BY MEANS #                          021323
    2       OF------ON THE EDGE OF THE FORM. #                                                                       021326
    3   CA NO HELP GIVEN.     #                                                                                      021331
    4   CA PUNCHED HOLES#                                                                                            021334
    5   FN EDIT1S    //SH//SP//C/R#                                                                                021337
    6   CA HOLES#                                                                                                    021339
    7   FN EDIT1S    //SH//C/R#                                                                                     021342
    8   TY  F INE.   Y OUR ANSWER IS CORRECT.   L ET@S TRY THE NEXT SECTION. #                                       021350
    9   UN  S ORRY, TRY AGAIN. #                                                                                     021354
   10   UN  S IGN OFF AND SEE YOUR INSTRUCTOR.#                                                                      021358
SEC1C    #                                                                                                           026740
    1   RD       O UR FINAL SIMPLE DEVICE IS A BIT MORE COMPLEX THAN THE #                                           026871
    2       OTHERS.   T HE  K EYSORT  P ROCESS USES A CARD WITH HOLES PUNCHED ON #                                   026756
    3       THE EDGES OF THE CARD. #                                                                                 026879
    4            P LEASE TURN TO THE SECOND ILLUSTRATION. #                                                          026766
    5   RD       I NFORMATION IS RECORDED ON THE CARD BY NOTCHING THE HOLES. #                                       026773
    6        T HESE HOLES MAY BE GROUPED TOGETHER TO REPRESENT DATA.   H OLES #
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    7       GROUPED IN THIS MANNER ARE CALLED CODE FIELDS.   T HE NUMBER OF *                                0267818
    8       HOLES IN EACH GROUP MAY VARY TO MEET THE NEEDS OF THE USER.   A  *                             0267895
    9       CODE KNOWN AS THE BINARY CODE IS USED TO REPRESENT DATA.   O NLY *                             0267973
   10       NUMERIC DATA MAY BE RECORDED. *                                                                0268051
   11             W HEN YOU ARE READY TO GO ON, PLEASE KEY AN EOB. *                                       0268094
   12    RD       I NORDER TO SORT OR SELECT DATA FROM THE CARDS, WE PASS A *                             0268162
   13       STEEL ROD OR NEEDLE THROUGH THE HOLES IN THE EDGE OF A DECK OF *                               0268239
   14       CARDS.   T HE CARDS THAT HAVE BEEN NOTCHED WILL FALL FROM THE  *                               0268315
   15       NEEDLE, AND THE UNNOTCHED CARDS WILL REMAIN ON THE NEEDLE.   T HIS *                           0268391
   16       PROCEDURE WILL BE FOLLOWED FOR EACH POSITION IN THE CODE FIELD. *                              0268471
   17        O NCE DATA HAS BEEN RECORDED MANUALLY INTO THE CARDS, THE SORT- *                             0268546
   18       ING OR SELECTION OF DATA IS AUTOMATIC. *                                                       0268626
   19             P LEASE KEY AN EOB. *                                                                    0268676
SEC1C Q1  *                                                                                               0214772
    1   QU  S UPPLY ONLY THE  LETTER  THAT INDICATES YOUR ANSWER.              T HE FIELDS ON A KEYS      0214823
        ORT CARD  ARE 6  *
    2                      9 A 0  ON THE TOP *                                                            0214942
    3                      9 B 0  ON THE EDGE *                                                           0214990
    4                      9 C 0  IN THE MIDDLE *                                                         0215039
    5                      9 D 0  ALL OVER THE CARD *                                                     0215090
    6   CA B*                                                                                             0215145
    7   FN EDIT1S    //SH//C/R*                                                                           0215157
    8   TY  V ERY GOOD.   L ET@S GO ON TO THE NEXT QUESTION. *                                            0215191
    9   WA D*                                                                                             0215254
   10   TY  T HIS IS NOT QUITE CORRECT, BUT WHY DON@T YOU TRY AGAIN. *                                    0215326
   11   UN SORRY, BUT THAT@S NOT IT.   T RY ONCE MORE. *                                                 0215339
   12   UN  T HE CORRECT ANSWER IS B, ON THE EDGE.   G O ON TO THE NEXT*                                  0215396
   13        QUESTION.  *                                                                               0215469
   14   BR SEC1C Q2  *                                                                                   0215496
SEC1C Q2  *                                                                                               0215547
    1   QU //SS009 //*                                                                                   0215598
    2        N OTE THAT THE PICTURE OF THE  K EYSORT CARD SHOWS THAT THE SCHOOL *                         0215621
    3       CODE HAS BEEN NOTCHED. *                                                                    0215702
    4        W HAT IS THE SCHOOL NUMBER THAT HAS BEEN NOTCHED INTO THE CARD /  *                         0215738
    5   CA 24*                                                                                           0215818
    6   CA TWENTYFOUR*                                                                                   0215833
    7   FN EDIT1S    //SH//SP//C/R*                                                                       0215856
    8   UN  O IC YOU LOOK AT THE SCHOOL CODE /    T RY AGAIN. *                                          0215892
    9   UN  T RY 24. *                                                                                   0215956
SEC1C G3  *                                                                                               0215979
    1   QU  I F THE KEYSORT NEEDLE IS PASSED THROUGH A DECK OF CARDS, AND THIS CARD *                    0216030
    2        WAS IN THE DECK, WOULD IT FALL INTO THE TRAY OR REMAIN ON THE NEEDLE IF *                    0216116
    3        YOU WANTED SCHOOLS 10-19 /  *                                                               0216203
    4   CA REMAINCNTHENEEDLE*                                                                            0216246
    5   FN EDIT1S    //ALL*                                                                              0216276
    6   CA REMAIN*                                                                                       0216304
    7   FN EDIT1S    //SH//C/R*                                                                          0216323
    8   TY  W E CAN ALSO CONCLUDE FROM YOUR ANSWER THAT THIS CARD MUST CONTAIN DATA *                    0216355
    9        CONCERNING SOME OTHER SCHOOL.   S O IT IS POSSIBLE TO OBTAIN TWO TYPES *                    0216441
   10        OF DATA FROM THE KEYSORT CARD--POSITIVE OR NEGATIVE. *                                      0216527
   11   UN  U NNOTCHED CARDS WOULD REMAIN ON THE NEEDLE.   N OTCHED CARDS WOULD FALL *                   0216595
   12       TO THE TRAY. *                                                                              0216682
   13   BR SEC1C G4  *                                                                                   0216708
SEC1C Q4  *                                                                                               0216759
    1   QU  I F WE WANT TO IDENTIFY THE CARDS USED TO REGISTER BOYS FROM THOSE USED TO *                  0216810
    2        REGISTER GIRLS, ONLY ONE POSITION OR CODE FIELD WOULD BE NECESSARY.   T HE *                0216899
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    3      CARDS USED FOR BOYS COULD BE NOTCHED, AND THE ONES USED FOR GIRLS WOULD NOT *                0216989
    4        BE NOTCHED.//SS010X// *                                                                    0217078
    5            T HEREFORE, BOYS@ CARDS WOULD FALL TO THE TRAY AND THE GIRLS@ CARDS WOULD *            0217115
    6      -----. *                                                                                     0217208
    7   CA REMAINONTHENEEDLE*                                                                           0217228
    8   FN EDIT1S    //ALL*                                                                            0217258
    9   CA REMAIN*                                                                                      0217286
   10   FN EDIT1S    //SH//C/R*                                                                        0217305
   11   UN REMAIN ON THE NEEDLE.*                                                                       0217337
   12   BR SEC1C Q5  *                                                                                  0217371
SEC1C Q5  *                                                                                            0217422
    1   QU       T HE KEYSORT PROCESS IS THE FIRST OF OUR SIMPLE AUTOMATED DEVICES FOR *               0217473
    2        PROCESSING DATA THAT RESEMBLES THE EQUIPMENT USED IN CARD PROCESSING SYSTEMS *            0217562
    3        OF TODAY.   O UR NEXT SECTION WILL BE ON UNIT RECORD SYSTEMS OF PROCESSING *              0217654
    4        DATA.   B EFORE WE CAN GO ON TO OUR NEW WORK, WE WILL HAVE A SHORT QUIZ ON *              0217744
    5        THE MATERIAL WE HAVE ALREADY COVERED. *                                                   0217834
    6            I F YOU WISH TO TAKE THE QUIZ, PLEASE TYPE YES.   I F YOU DO NOT WISH TO *           0217887
    7        TAKE THE QUIZ AT THIS TIME, PLEASE TYPE NO. *                                             0217979
    8   CA YES*                                                                                         0218038
    9   FN EDIT1S    //SH//C/R*                                                                        0218054
   10   WA NO*                                                                                          0218086
   11   FN EDIT1S    //SH//C/R*                                                                        0218101
   12   TY  W HEN YOU ARE READY TO TAKE THE QUIZ, PLEASE USE THE FOLLOWING FORMAT.   U SE *           0218133
   13        THE CONTROL WORDS--GO TO--AND THE LABEL SEC1TEST.   Y OU SHOULD COPY THIS *              0218225
   14        FORMAT BEFORE SIGNING OFF.   P LEASE SIGN OFF. *                                          0218314
   15   UN  P LEASE TYPE YES OR NO $  *                                                                 0218376
SEC1TEST  *                                                                                            0218416
    1   QU 1.   T HE SIMPLEST FORM OF AUTOMATED DEVICE IS -------. *                                    0218467
    2   CA  N O HELP GIVEN.    *                                                                        0218536
    3   CA CARBONPAPER*                                                                                 0218569
    4   FN EDIT1S    //ALL*                                                                            0218593
    5   AD 1//C1*                                                                                       0218621
    6   TY  T RY THE NEXT ONE. *                                                                        0218639
    7   UN  T RY THE NEXT ONE. *                                                                        0218672
    8   AD 1//C1*                                                                                       0218705
    9   BR TEST1Q2   *                                                                                  0218723
TEST1Q2   *                                                                                            0218774
    1   QU 2.   N AME ONE OTHER SIMPLE AUTOMATED DEVICE. *                                              0218825
    2   CA  N O HELP GIVEN.    *                                                                        0218884
    3   CA EMBOSSEDPLATE*                                                                               0218917
    4   CB SENSITIZEDPAPER*                                                                             0218943
    5   CB PEGBOARD*                                                                                    0218971
    6   CB KEYSORT*                                                                                     0218992
    7   CB KEYSORTPROCESS*                                                                              0219012
    8   FN EDIT1S    //ALL*                                                                            0219039
    9   AD 1//C1*                                                                                       0219067
   10   TY  L ET 6 S GO ON. *                                                                           0219085
   11   UN  L ET 6 S GO ON. *                                                                           0219115
   12   AD 1//C2*                                                                                       0219145
   13   BR TEST1Q3   *                                                                                  0219163
TEST1Q3   *                                                                                            0219214
    1   QU 3.   A  CREDIT CARD IS A FORM OF THE ------. *                                               0219265
    2   CA  N O HELP GIVEN.    *                                                                        0219323
    3   CA EMBOSSEDPLATE*                                                                               0219356
    4   FN EDIT1S    //ALL*                                                                            0219382
    5   AD 1//C1*                                                                                       0219410
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    6   TY  T RY THE NEXT QUESTION. #                                                    0219428
    7   UN  T RY THE NEXT QUESTION. #                                                    0219466
    8   AD 1//C2#                                                                        0219504
    9   BR TEST1Q4   #                                                                   0219522
TEST1Q4   #                                                                            0219573
    1   QU 4.   T HE ------ USES NUMBERED PEGS TO ALIGN FORMS. #                         0220000
    2   CA  N O HELP GIVEN.    #                                                         0220065
    3   CA PEGBOARD#                                                                     0220098
    4   FN EDIT1S    //ALL#                                                           0220119
    5   AD 1//C1#                                                                        0220147
    6   TY  E ACH ANSWER IS BEING RECORDED.   Y OU MAY OBTAIN YOUR SCORE AT #           0220165
    7   TY THE END OF THE TEST FROM YOUR INSTRUCTOR. #                                   0220243
    8   UN  E ACH RESPONSE IS BEING RECORDED.   Y OU MAY OBTAIN YOUR SCORE AT #         0220298
    9       THE END OF THE TEST FROM YOUR INSTRUCTOR. #                                  0220378
   10   AD 1//C2#                                                                        0220433
   11   BR TEST1Q5   #                                                                   0220451
TEST1Q5   #                                                                            0220502
    1   QU 5.   T HE HOLES AROUND THE EDGE OF THE ----- CARD ARE NOTCHED TO #            0220553
    2       RECORD DATA. #                                                               0220631
    3   CA  N O HELP GIVEN.    #                                                         0220657
    4   CA KEYSORT#                                                                      0220690
    5   FN EDIT1S    //ALL#                                                           0220710
    6   AD 1//C1#                                                                        0220738
    7   TY  G O ON. #                                                                    0220756
    8   UN  G O ON. #                                                                    0220778
    9   AD 1//C2#                                                                        0220800
   10   BR TEST1Q6   #                                                                   0220818
TEST1Q6   #                                                                            0220869
    1   QU 6.   A LTHOUGH DATA IS RECORDED MANUALLY ON THE KEYSORT CARD, THE #           0220920
    2       SELECTION OR SORTING OF CARDS IS -----. #                                    0220999
    3   CA  N O HELP GIVEN.    #                                                         0221052
    4   CA AUTOMATIC#                                                                    0221085
    5   FN EDIT1S    //ALL#                                                           0221107
    6   AD 1//C1#                                                                        0221135
    7   TY  N EXT QUESTION. #                                                            0221153
    8   UN  N EXT QUESTION. #                                                            0221183
    9   AD 1//C2#                                                                        0221213
   10   BR TEST1Q7   #                                                                   0221231
TEST1Q7   #                                                                            0221282
    1   QU 7.   T HE UNNOTCHED HOLES ON THE KEYSORT CARD CAUSE THE CARDS TO #            0221333
    2       ----- ON THE NEEDLE. #                                                      0221411
    3   CA  N O HELP GIVEN.      #                                                       0221445
    4   CA REMAIN#                                                                       0221480
    5   CB STAY#                                                                         0221499
    6   FN EDIT1S    //ALL#                                                           0221516
    7   AD 1//C1                                                          #              0221544
    8   TY  Y OU HAVE COMPLETED THE QUIZ. #                                              0221624
    9   UN  Y OU HAVE COMPLETED THE QUIZ. #                                              0221668
   10   AD 1//C2#                                                                        0221712
   11   BR TEST1END  #                                                                   0221730
TEST1END  #                                                                            0221781
    1   QU  W OULD YOU LIKE TO KNOW YOUR SCORE /    T YPE YES OR NO. #                   0221832
    2   CA YES#                                                                          0221903
    3   BR SCRT1D    //-4//C1#                                                         0221919
    4   BR SCRT1C    //-5//C1#                                                         0221978
    5   BR SCRT1B    //-6//C1#                                                         0222037
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    6   BR SCRT1A    //-7//C1#                                                                                    0222096
    7   CA NO#                                                                                                   0222155
    8   TY  Y OU MAY OBTAIN YOUR SCORE FROM YOUR INSTRUCTOR AT A LATER TIME. #                                    0222170
    9   RD  P LEASE DEPRESS THE EOB  9 ALTN CODING AND 5 0 . #                                                   0222249
   10   BR SEC2      #                                                                                          0222312
SCRT1A    #                                                                                                    0222363
    1   QU  Y OU RECEIVED AN  A .   L ET 6 S GO ON TO THE NEXT SECTION.   P LEASE #                             0222414
    2      DEPRESS THE A KEY. #                                                                                0222498
    3   CA A#                                                                                                   0222530
    4   BR SEC2      #                                                                                          0222544
    5   UN  P LEASE DEPRESS THE A KEY $  #                                                                      0222595
SCRT1B    #                                                                                                    0222638
    1   QU  Y OU RECEIVED A  B .   P ROCEED TO THE NEXT SECTION.   P LEASE #                                    0222689
    2      DEPRESS THE A KEY. #                                                                                0222766
    3   CA A#                                                                                                   0222798
    4   BR SEC2      #                                                                                          0222812
    5   UN  P LEASE DEPRESS THE A KEY $  #                                                                      0222863
SCRT1C    #                                                                                                    0222906
    1   QU  Y OU RECEIVED A  C .   P ROCEED TO THE NEXT SECTION.   P LEASE #                                    0222957
    2      DEPRESS THE A KEY. #                                                                                0223034
    3   CA A#                                                                                                   0223066
    4   BR SEC2      #                                                                                          0223080
    5   UN  P LEASE DEPRESS THE A KEY $  #                                                                      0223131
SCRT1D    #                                                                                                    0223174
    1   QU  Y OU DID NOT DO TOO WELL.   Y OUR GRADE IS A  D .   T HIS MEANS #                                   0223225
    2      YOU HAD 3 OR MORE INCORRECT ANSWERS.   L ET 6 S SEE IF YOU CAN DO A #                               0223303
    3     BETTER JOB ON THE NEXT SECTION.   P LEASE STRIKE THE A KEY. #                                         0223364
    4   CA A#                                                                                                   0223456
    5   BR SEC2      #                                                                                          0223470
    6   UN  P LEASE STRIKE THE A KEY $  #                                                                       0223521
SEC2      #                                                                                                    0223563
    1   RD                    S ECTION 2 #                                                                      0223614
    2           W E CAN CONCLUDE FROM THE PREVIOUS SECTION ON SIMPLE DEVICES THAT AUTOMATION   #                0223658
    3      IS NOT A MACHINE.   R ATHER IT IS A PROCESS.   T HE CHIEF AIM OF AUTOMATION IS TO   #               0223756
    4      REDUCE HUMAN EFFORT AND HANDLING TO OBTAIN LESS ERROR.   T HE SECONDARY AIM IS TO   #               0223853
    5      INCREASE THE PROCESSING SPEED.   W E SHALL NOW ATTEMPT TO APPLY THE PRINCIPLES OF #                 0223950
    6      AUTOMATION TO  D ATA  P ROCESSING. #                                                               0224045
    7           D ATA PROCESSING IS THE PROCESSING OF INFORMATION.   T HE HUGE VOLUMES OF DATA   #            0224093
    8      THAT MUST BE HANDLED EVERY DAY BY BUSINESS, SCIENCE AND GOVERNMENT STAGGERS THE   #                0224193
    9      IMAGINATION.   I T IS PHYSICALLY IMPOSSIBLE TO PROCESS, CATALOGUE AND STORE ALL THE   #           0224288
   10      VAST QUANTITIES OF INFORMATION ACCUMULATED BY ALL SOURCES WITHOUT THE HELP OF MACHINES. #           0224387
   11       A UTOMATED EQUIPMENT ENABLES US TO GATHER DATA, MANIPULATE IT, DRAW CONCLUSIONS   #               0224488
   12      FROM IT, AND STORE IT FOR FUTURE USE.   R OUTINE HANDLING CAN BE PERFORMED AT HIGH   #           0224584
   13      SPEEDS, FREEING MEN AND WOMEN FOR MORE IMPORTANT TASKS.  T HESE MACHINES CAN DO MANY   #          0224682
   14      OF THE TASKS THAT HUMANS FIND BORING WITHOUT BECOMING BORED.   B ECAUSE OUR MACHINES   #          0224782
   15      DO NOT BECOME BORED OR TIRED, THEY MAKE VERY FEW MISTAKES.   M OST ERRORS THAT DO   #             0224882
   16      OCCUR ARE THE RESULT OF HUMAN ERROR OR MACHINE MALFUNCTION. #                                      0224979
   17           A LL INFORMATION HANDLING, OR DATA PROCESSING, GOES THROUGH A CYCLE.   F IRST, #             0225052
   18      THE DATA TO BE PROCESSED MUST BE ASSEMBLED.   T HEN IT MUST BE RECORDED IN A CONVENIENT #         0225150
   19      FORM.   N EXT, IT MUST BE MANIPULATED.   T HE RESULTS MUST BE REPORTED.   F INALLY,   #          0225251
   20      IT MUST BE STORED.   T HE NEXT SLIDE SHOWS THE DATA PROCESSING CYCLE IN SEQUENCE.   #             0225350
   21       P LEASE DEPRESS THE RESPONSE KEY.#                                                                0225447
   22   TY //SSOIO // #                                                                                       0225494
FINISH    #                                                                                                    0268859
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REYN      *                                                        0203451
BEGIN     *                                                        0203502
SEC1A     *                                                        0204630
SEC1AQ1   *                                                        0205936
SEC1AQ2   *                                                        0207080
SEC1AQ3   *                                                        0207843
SEC1B     *                                                        0208772
SEC1BQ1   *                                                        0210407
SEC1BQ2   *                                                        0211177
SEC1B Q3  *                                                        0211756
SEC1B Q4  *                                                        0212360
SEC1B Q5  *                                                        0213095
SEC1C     *                                                        0213589
SEC1C Q1  *                                                        0214772
SEC1C Q2  *                                                        0215547
SEC1C Q3  *                                                        0215979
SEC1C Q4  *                                                        0216759
SEC1C Q5  *                                                        0217422
SEC1TEST  *                                                        0218416
TEST1Q2   *                                                        0218774
TEST1Q3   *                                                        0219214
TEST1Q4   *                                                        0219573
TEST1Q5   *                                                        0220502
TEST1Q6   *                                                        0220869
TEST1Q7   *                                                        0221282
TEST1END  *                                                        0221781
SCRT1A    *                                                        0222363
SCRT1B    *                                                        0222638
SCRT1C    *                                                        0222906
SCRT1D    *                                                        0223174
SEC2      *                                                        0223563
FINISH    *                                                        0268859
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## APPENDIX II

List of Visitors

Partial list of visitors to Providence College Computer Center to view and try Computer Assisted Instruction techniques.

1. National Teachers Corps enrollee's from Rhode Island College.
2. Reporter from the Providence Journal/Bulletin.
3. Reporter and Photographer from the Pawtucket Times.
4. Representatives from Harvard University Bio-Medical Department, Dr. Lawrence Stolurow: department head.
5. Providence School Superintendent; Dr. Charles O'Connor.
6. Various priests and nuns from the Providence Diocese School Department.
7. Instructors and students from Rodman Job Corps Camp at New Bedford, Mass.
8. Representatives from Entelek Incorporated of Newburyport, Mass.
9. Mrs. Patricia Duffy, Vocational Education Coordinator Pemberton Township School District, Pemberton, New Jersey.
10. Dr. Sidney High, United States Office of Education.
11. Mr. Kenneth Mellor, Manpower Development Project Supervisor, Rhode Island Department of Education.
12. Dr. Finger, Rhode Island College.
13. Representatives from various departments of Brown University.

## APPENDIX III

Reprint "Pawtucket Times", August, 1966

# This 'Teacher' Takes Nobody's Back Talk

The pupil hesitates, glances around, fiddles with a shirt button, and makes a guess. It's wrong.

"Sorry about that. Let's make one furthur attempt at the correct answer," the "instructor" says.

Surrounded by concrete block walls and electronic gadgetry, the pupil stares at the "teacher:" An oversized electric typewriter. "Sorry, wrong again," the thing chatters. "The correct answer is. . ."

Hardly fantasy, this scene actually took place recently in the computor center of Providence College. There, four men are among a group programming an IBM 1401 computor to be a teaching machine.

"Why, this thing could eliminate teachers!" the pupil exclaimed. Commenting later Robert Reynolds, of Providence, a teacher at Tolman, smilingly disagrees. "It will definitely serve to supplement teachers and use them to the best advantage, though."

Mr. Reynolds is chairman of the coordinating committee charged with writing courses in various subjects for the computor to teach. Others in the committee are Edward P. Sherlock of 22 Miles Ave., Pawtucket, and George J. Grant of 120 Dexter St., Cumberland, both from Pawtucket Vocational High School, and Chase E. Loomis, 161 Balch St. Pawtucket, who teaches at Barrington High.

Their project, which is one of 14 in the nation underwritten by the U.S. Department of Education, is aimed at students on the high school level. Mr. Reynolds has written a program on introductory data processing, and Mr. Sherlock on introductory electrical studies.

The typical instruction program goes something like this: The pupil is asked to identify himself through code words which he types out on a "terminal": in this case, the oversized typewriter. On the same typewriter, the computor explains the purpose of the particular course, and then proceeds to present information and ask questions.

The thing that brings the project many steps beyond being a mere electronic textbook is that it treats the pupil as an individual. "I have written one program that takes 22 pages," Mr. Reynolds said. "An outstanding student could finish it in 10 minutes. A slower student could spend hours."

"The student sets his own pace, and is not handicapped if that pace is different from the rest of the class" the Tolman teacher said.

There are several reasons why these machines will never replace teachers — the main one being that nothing will ever replace the desire to please a human, flesh and blood professor.

But his computor substitute holds out a seemingly unlimited number of uses for the future.

Schools as we know them could be eliminated, the computor specialist theorizes. Instead of spending millions to house pupils in school buildings, their education could be brought to them by installing the terminals of such a computor in a student's home.

The possibilities seem only to be limited by man's imagination.

COMPUTOR programmer Edward Sherlock, seated, acts as pupil to test electronic "brain" that he and, from left, George Grant, Robert Reynolds and Chace Loomis are programming to become a mechanical "teacher."

# APPENDIX IV

## Time Utilization Table

## TIME UTILIZATION TABLE

| Activity | Hrs. Wkly. | Period | Total Hrs. |
|---|---|---|---|
| Formal Instruction | 2 | 1 hr. | 12 |
| Role of Proctor | 2 | 1 hr. | 12 |
| Use of 1050 | 2 | 1 hr. | 12 |
| Discussion | 2 | 1 hr. | 12 |
| Entry and Testing | 2 | 2 hrs. | 24 |
| Participant Preparation | 15* | --* | 90* |
| | 25 | | 162 |

* No actual time record was kept by participants. However, several participants estimated their own time at 15 hours of work outside committed or allotted time.

# APPENDIX V

## Participants and Course Title

## PARTICIPANTS AND COURSE TITLES

| PARTICIPANTS | COURSE TITLES |
|---|---|
| Robert G. Brooks | Business Law Vocabulary |
| Joseph DeFusco | Survey in General Insurance |
| Joseph A. Depasquale | Introduction to Transistors |
| Edward A. DeSanto | Basic Electric Arc Welding |
| George J. Grant | Special Factors in Math |
| Chace E. Loomis, Jr. | Automobile Insurance |
| Arthur Montanaro | Filing |
| Amato Nocera | General Mathematics |
| Robert R. Reynolds | Introduction to Data Processing |
| Edward P. Sherlock | Basic Electrical Theory |
| Allen F. Swann | Basic Data Processing |
| Raynond Szeflinski | Postal Services |
| Frank R. Walker, III | English Grammar |

# APPENDIX VI

## Communities and Schools Represented

## COMMUNITIES AND SCHOOLS REPRESENTED

| HIGH SCHOOLS | COMMUNITIES | STUDENTS |
|---|---|---|
| Barrington High School | Barrington, R. I. | 1 |
| Coventry High School | Coventry, R. I. | 2 |
| Cranston High School | Cranston, R. I. | 1 |
| Pilgrim High School | Warwick, R. I. | 2 |
| Tolman High School | Pawtucket, R. I. | 1 |
| Warren High School | Warren, R. I. | 1 |

| VOCATIONAL SCHOOLS | COMMUNITIES | STUDENTS |
|---|---|---|
| Pawtucket Vocational High School | Pawtucket, R. I. | 2 |
| Vocational Tech. School of Rhode Island | Providence, R. I. | 3 |

# APPENDIX VII

## Basic Computer Assisted Instruction System

## BASIC COMPUTER ASSISTED INSTRUCTION SYSTEM

1. Software: Basic IBM Coursewriter Programming Language*

2. Hardware:

| QUANTITY | ITEM |
|---|---|
| 1 | 1401 Central Processing Unit |
| 1 | 1402 Card Reader-Punch |
| 1 | 1403 Line Printer |
| 1 | 1409 Model 2 |
| 2 | 1026 Transmission Control Unit |
| 2** | 1050 Data Communications System |

* As adapted by the University of Texas to allow batch-loading of punch cards.

**One 1050 Data Communications System has been modified to utilize a slide projector and a tape recorder. This unit serves as the master terminal.

# APPENDIX VIII

## Report of Technical Difficulties

# DIFFICULTIES ENCOUNTERED WHILE OPERATING COURSEWRITER

I) -Loss of continuity of course material
-Loss of course material
-Branching to improper course material

All three problems can be linked to the same weakness of the original CAI system. In order to explain the problem involved it is necessary to consider in some detail the medium of storage employed by the CAI system. This medium is a relatively high-speed external storage device called a disk. Since disk storage is not basically a sequential storage medium, some means of identifying the location of the desired material on the disk must be available. The physical location of a record on a disk lies within a sector of the disk; each sector having a unique address.
Therefore, if course material is to be stored on a disk and a course is to maintain a logical continuity, it is necessary to obtain from the course record presently being processed by the CPU, the physical location of the next logical record; not necessarily sequentially stored. This portion of the record is called a pointer, since it literally points to the physical location (address) of the next logical record of the course.
If an author should desire to insert some material in his course, the CAI system would physically position this material at the end of the course.
To maintain the logical continuity, it would be necessary to

a. Break the chain of pointers at the logical point of insertion
b. Cause the pointer in the record preceding the insertion to point to the first record of the inserted material, and
c. Cause the pointer of the last record of the inserted material to point back to the record that should follow logically; i.e. a so-called "link-up" and "link-back" would have to be established.

If at any time during this process of insertion, the CAI system should be interrupted, either by a hardware malfunction, a software failure, or just plain author error the "link-back" address would be lost and data of an indeterminate nature would be inserted in the "link-back" pointer of the last record inserted. The inserted course material still would be available to the user however, the course would lose its logical continuity after reaching the end of the insertion since no connection had been established to the next logical record. This condition would invariably lead to an interrupt condition, causing the breakdown of the system and possibly the destruction of valuable course material.
In conjunction with this problem, the physical location of some special function keys on the IBM 1050 keyboard has shown to be the principle reason for author error. The manufacturer has been informed concerning this.

II) -Inability of the advanced version of Coursewriter to address the IBM 1050 terminals present at Providence College.

During the course of this contract, we obtained from the University of Texas an improved version of Coursewriter. The original version, as supplied by IBM, under an inflexible system of console addressing, restricted the modes of console operations. For example, the proctor (supervisor of the system) could exercise his functions only from the first console of the system, virtually chaining him to that device and also removing one terminal from classroom usage, since this terminal had to be placed in the immediate vicinity of the computer itself.
The CAI system obtained from Texas U. permitted the proctor to control the system from any console, thus releasing one further terminal for student and author usage. To make use of this flexibility, the terminal addresses; i.e. the codes by means of which the CPU gains access to a terminal were changed. Since we had insufficient documentation on the Texas system, the lack of any response from the terminals was first attributed to a software malfunction. After extensive debugging and consultations with personnel from the local IBM Branch Office and experts from the Advanced Maintenance and Development Department of the IBM FE Division in Poughkeepsie, N. Y., it was determined that the terminal addresses employed by the original version of Coursewriter were sufficiently different from the codes used by the Texas system to prevent any response at all from the terminals.
Once this fact had been established, a relatively simple change in the wiring of the IBM 1050 terminals involved remedied the situation.
No difficulties have since been experienced in this particular part of the CAI system.